

DEPARTMENT OF TRANSPORTATION**ENGINEERING SERVICE CENTER**

Transportation Laboratory

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**METHOD OF MAKING, HANDLING, AND STORING
CONCRETE COMPRESSIVE TEST SPECIMENS IN THE FIELD**

CAUTION: Prior to handling test materials, performing equipment setups, and/or conducting this method, Caltrans testers are required to read “**SAFETY AND HEALTH**” in Section F of this method. It is the responsibility of the user of this method to consult and use appropriate safety and health practices and determine the applicability of regulatory limitations before any testing is performed.

A. SCOPE

The procedure for making, handling, and storage of concrete compressive strength test specimens in the field is described in this method.

This method is applicable to concrete specified as 50-mm maximum nominal size aggregates.

B. APPARATUS

The following is required. It may be obtained from the Office of Purchasing and Warehousing, Department of Transportation, Sacramento, CA.

1. Molds — 150 mm by 300 mm test cylinder molds with lids, conforming to ASTM Designation: C 470.
2. Tamping rod, 15-mm diameter by 0.6 m long with one or both ends machined to a hemispherical tip.
3. Suitable scoop, any appropriate metal scoop will be satisfactory.

C. PREPARATION OF TEST SPECIMENS**1. Sampling Fresh Concrete**

- a. The procedure for sampling shall be as outlined in CTM 539, “Sampling Fresh Concrete.” Write the concrete sample location (deck, footing, girder, etc.) on the sample identification card. Samples should normally contain not less than 0.03 m³.

- b. Transport samples in watertight containers to the place where the test specimens are to be fabricated. Fabricate specimens as near as practicable to the place where they are to be stored during the first 24 hours.

2. Test Specimen Fabrication

- a. Place test molds on a firm, flat surface to prevent distortion of the bottom surface. When more than one specimen is to be made from the same batch, make all specimens simultaneously. Place and rod the first layer in each mold before proceeding to the second layer and so on, through the third layer. Place an approximate 100-mm layer of concrete in the mold with a circular motion of the scoop to distribute the concrete evenly in the mold. Rod the layer 25 times with the specified tamping rod, penetrating full depth into the layer, but not forcibly striking the bottom of the mold. Distribute the 25 strokes in an increasing radial spiraling manner over the surface of the layer. Place two additional layers in the mold, each approximately one-third of the volume of the mold, and rod each layer with 25 strokes of the tamping rod. When rodding the second layer, penetrate just into the first layer with each stroke, and also penetrate into the second when rodding the third layer. Pat sides of the mold lightly by hand, or jig by rocking the mold from side to side, after each layer is

rodded to release any entrapped air along the sides of the mold.

- b. After the top layer has been rodded and the sides of the mold patted, strike off the surface of the concrete even with the top edge of the mold. Wipe the sides of the mold free of excess concrete and press the lid on to prevent evaporation.
 - c. To prevent loss of moisture, seal the lid to the mold with masking tape. Do not apply water on top of the concrete before covering.
 - d. Clearly identify cylinders on the side of the mold with a marking pen showing the contract number, sample number, and the testing age designated.
 - e. If specimens are representative of concrete for precast products, vibration similar to that applied to the member being manufactured may be used to consolidate the specimen in lieu of the rodding procedure described in "a" and "b."
3. Care of Test Specimens
- a. Place the concrete test cylinders in their field curing location as soon as possible after they are fabricated, being careful not to disturb the concrete in its plastic state. The curing location must be a firm level surface, free from vibration and otherwise protected from disturbance. Cure all test specimens with the axis of the cylinder vertical to avoid a sloping end in the hardened concrete. Once the concrete has begun to set, do not disturb specimens for 20 ± 4 h.
 - b. Handling and storage of cylinders shall conform to one of the following methods:
 - (1) Method 1 — Cylinders for determining the acceptability of concrete which has a specified 28 day strength:

Except for steam-cured concrete, cylinders in this category shall be stored under conditions that maintain a temperature of 15.5 to 27°C immediately adjacent to the

specimens for a period of one day. This can conveniently be achieved by the use of a water tank. At the end of 20 ± 4 h remove the lids from the cylinder cans and store the specimens in a water bath at a temperature of 15.5 to 27°C . At an age of two days and no later than five days, replace lids, resealing with masking tape, and ship directly to the laboratory. At the laboratory, specimens shall be stored at $23 \pm 2^{\circ}\text{C}$.

- (2) Method 2 — Cylinders for evaluating the in-place strength of concrete in a structure prior to applying loads or stresses:

For determining compressive strength under this category, store specimens at or near the structure in a semi-sheltered location where the temperature of the test specimens will be approximately that of the concrete in the structure. Leave the specimens at the structure for as long a period of time as possible before shipping to the laboratory. During the storage time at the structure, keep specimens in a plywood box (without insulation) or other suitable shelter, but in a shaded location. Avoid conditions of extreme exposure to wind and sun, as well as conditions of overprotection from weather variations.

- (3) Method 3 — Cylinders for evaluating steam cured concrete for compliance with strength specifications:

Cylinders for determining time of prestressing loading shall be cured in the same manner as the concrete in the member.

Cylinders for determining compliance with 28-day strength requirements shall be cured in the same manner as the member until completion of the steam curing process and then transferred to a water bath or moist room at 15.5 to 27°C until tested.

As an alternative to shipping to a State laboratory, testing may be done using the producer's equipment,

provided that satisfactory evidence has been furnished that such equipment, together with testing procedures, comply to accepted standards of testing, such as ASTM Designation: C 39.

D. IDENTIFICATION OF TEST CYLINDERS

For compressive strength tests, Form TL-0502 sample card is used. The card must be complete—there should not be any blank spaces. Designation of type of concrete must be included (Class B, 24.1 MPa, etc.).

Source of aggregates should indicate the deposit from which the aggregates were obtained, such as “Kaiser-Radum”, or “Chevreux-Bear River”, and not the batch plant. The SMARA number for the aggregate source should also be indicated.

A uniform system of marking cylinders is used. This system consists of the contract number and the sample number. The sample number consists of a series of digits separated by dashes (-) to indicate: method of storage for curing; age at which cylinder(s) are to be tested; the cylinder number of the pair, or the group of 5, which is to be tested; and job coding. Use of flow pen to mark each sample can.

EXAMPLE 1

Contact No. 03-100844
Sample No. 1-28-1/5
Date Cast _____

In the sample number shown above, the first digit indicates method 1 storage for curing; use only one digit for this designation. The second group of two digits indicates that the cylinder is to be tested at 28 days; use two digits for the test age. The third 1/5 symbol indicates that it is the No. 1 cylinder of the 5-cylinder trial batch sample; the No. 2 cylinder would be marked 2/5, etc. If only one sample card was made for two cylinders, the third symbol *on the card* would be 1 and 2/5. The last four spaces are reserved for any desired job coding consisting of number, letters, or a combination of both.

EXAMPLE 2

Contract No. 03-10844
Sample No. 2-14-2/2
Date Cast _____

In this example the first digit indicates method 2 storage for curing. The second group of two digits indicates that the cylinder is to be tested at 14 days. The third 2/2 symbol indicates that it is the No. 2 cylinder of a 2-cylinder test group. Again, if only one sample card is made for the two cylinders, the third symbol *on the card* would be 1 and 2/2. The last four spaces represent any desired job coding consisting of numbers, letters, or a combination of both.

In the space for “Water-weight. per sack”, indicate the total mass of water used per sack of cement in the mix based on actual mass (not design weights). On the last (blank) line of the concrete information box indicate specified concrete strength or class if any. Otherwise mark the space with a line. Under “Remarks” indicate if density of the hardened concrete cylinder(s) is required. The laboratory will not furnish density (Kg/m³) data unless it is specifically requested. Make out a sample card for each pair of cylinders shipped in the same carton.

NOTE

In lieu of molds specified under B-1, reusable vertical molds conforming to the requirements of ASTM Designation: C 192 may be used.

F. SAFETY AND HEALTH

Prior to handling, testing or disposing of any waste materials, Caltrans testers are required to read: Part A (Section 5.0), Part B (Sections: 5.0, 6.0 and 10.0) and Part C (Section 1.0) of Caltrans Laboratory Safety Manual. Users of this method do so at their own risk.

REFERENCES:

California Tests 521 and 539
ASTM Designations: C 31, C 39, C 172, C 192, and
C 470

End of Text (California Test 540 contains 3 pages)